

Amendment and Response under 37 C.F.R. 1.116

Applicant: Xiang Dai et al.

Serial No.: 10/612,663

Filed: July 2, 2003

Docket No.: 200308566-1/H300.211.101

Title: SUPPORTING A CIRCUIT PACKAGE INCLUDING A SUBSTRATE HAVING A SOLDER COLUMN ARRAY

IN THE CLAIMS

Please cancel claims 9, 11-12, 18-19, 22, and 24.

Please add claim 29.

Please amend claims 8, 10, 15, 17, 21, 25, 27, and 28 as follows:

1-7. (Cancelled)

8. (Currently Amended) An electronic component system comprising:
a printed circuit board;
an integrated circuit package including a substrate having a solder column array connecting the integrated circuit package directly to the printed circuit board and a lid, the lid including an extended portion that extends directly from the substrate outwardly over an edge of the substrate; and
a plurality of supports with one support disposed at each corner of the integrated circuit package underneath the lid of the integrated circuit package, and each support sized and shaped to enable a gap between the extended portion of the lid of the integrated circuit package and the supports in a first assembled state of the system, and to enable contact between the extended portion of the lid of the integrated circuit package and the supports without the gap in a second assembled state of the system, and wherein each support includes a body and a pair of wings extending from the body to be substantially perpendicular to each other for contacting the edges of the substrate of the integrated circuit package, the support sized and shaped to cause the wings to be underneath and in contact with the extended portion of the lid in the second assembled state of the system and the body sized and shaped to extend outwardly in a direction generally opposite from the wings to be exposed relative to, and not in contact with the extended portion of the lid;
a compressive force mechanism configured to apply a compressive force on the integrated circuit package against the printed circuit board in both the first assembled state of the system and the second assembled state of the system, with the compressive force translated from the integrated circuit package to the printed circuit board through only the solder column array in the first assembled state of the system and translated from the

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integrated circuit package to the printed circuit board through both the solder column array and the supports via the extended portion of the lid in the second assembled state of the system; and

a heat sink mounted on top of the lid of the integrated circuit package, the lid being separable from and independent of the heat sink, with the heat sink being removably secured relative to the integrated circuit package via the compressive force.

9. (Canceled).

10. (Currently Amended) The system of claim 98 wherein the solder column array has a first height in the first assembled state and a second height in the second assembled state, the second height being less than the first height is configured to decrease in height over time in response to application of the compressive load until a substantial portion of the compressive load is shifted to the supports.

11. (Canceled).

12. (Canceled).

13. (Previously Presented) The system of claim 8 wherein each support includes a detent and the printed circuit board includes a plurality of holes shaped and sized for receiving the detent of the supports so that each support is secured to the printed circuit board upon insertion of the detent of the support into the hole of the printed circuit board.

14. (Original) The system of claim 8 wherein each support is made from at least one of a plastic material, a metal material, and a composite material, with the material having a coefficient of thermal expansion that is substantially the same as a coefficient of thermal expansion of the substrate and the solder column array.

15. (Currently Amended) An electronic component system comprising:
means for carrying circuit components;

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means for performing circuit functions including:

a substrate;

first means for directly electrically connecting and directly mechanically connecting the substrate to the means for carrying circuit components; and

second means, disposed on top of the substrate and extending from the substrate outwardly beyond the substrate, for translating a compressive load to the means for carrying circuit components;

~~means for electrically and meehanically connecting the means for performing circuit functions to the means for carrying circuit components;~~

means for applying the compressive load to force the means for performing circuit functions against the means for carrying circuit components through the first means; and

support second means, removably attachable to the means for carrying circuit components, for mechanically connecting the second means for performing circuit functions translating to the means for carrying circuit components, the support means configured to enable a gap between the second means for translating performing circuit funetions and the support means for carrying circuit components in a first assembled state of the system while the compressive load is applied, and to enable translation of athe compressive force from the second means for translating performing circuit funetions via the support means to the means for carrying circuit components without the gap in a second assembled state of the system while the compressive load is applied.

16. (Currently Amended) The system of claim 15 wherein the means for carrying circuit components comprises a printed circuit board and wherein the means for performing circuit functions comprises an integrated circuit package that includes the substrate and the second means for translating.

17. (Currently Amended) A support for a column grid array package mounted on a printed circuit board via a solder column array of the column grid array package, the column grid array package having a substrate and a lid extending outwardly over an edge of the substrate, the support comprising:

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a shim sized and configured to be insertable underneath the lid of the column grid array package, configured for securing to the printed circuit board, and sized and configured to bear a substantial majority of a static compressive force applied to the column grid array package, through the lid, relative to the printed circuit board, with the shim bearing the static compressive force only after a period of time during which the solder column array decreases in height due to creep comprising at least one of:

a body and a pair of wings extending from the body to be substantially perpendicular to each other for contacting the edges of the substrate of the integrated circuit package, the shim sized and shaped to cause the wings to be underneath and in contact with the lid, and the body sized and shaped to extend outwardly in a direction generally opposite from the wings to be exposed relative to, and not in contact with the lid; and

a pair of wing portions that are generally perpendicular to each other and joined together at one end to define a corner, each shim being sized and shaped to contact and support the lid of the integrated circuit package via the wing portions, and a single band sized and shaped to surround and contact the shim and apply a lateral force against the wing portions and the corner of the shim to secure the shim in position underneath the lid of the integrated circuit package and to maintain the shim in position relative to the printed circuit board.

18. (Canceled).

19. (Canceled)-.

20. (Currently Amended) The support of claim 17 wherein the body of the shim comprises a body including a detent configured for insertion into a portion of the printed circuit board to secure the shim relative to the printed circuit board.

21. (Currently Amended) The system of claim 8 wherein the body of the support is sized, shaped, and positioned relative to the integrated circuit package to be secured relative to the printed circuit board and further comprising via a fastener econfigured to extend through

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the printed circuit board and into the body of the support while the wings of the support are in position below and in contact with the extended portion of the lid of the integrated circuit package.

22. (Canceled).

23. (Previously Presented) The system of claim 8 wherein the supports are configured to be mechanically fastened to the printed circuit board without an adhesive and configured to support the lid of the integrated circuit package in the second assembled state without an adhesive between the lid of the integrated circuit package and the support.

24. (Canceled).

25. (Currently Amended) The system of claim 8, wherein the electronic component system is comprises a computer system.

26. (Previously Presented) The system of claim 15 16 wherein the first means for directly electrically connecting and directly mechanically connecting the means for performing circuit functions to the means for carrying circuit components comprises a solder column array connecting the integrated circuit package to the printed circuit board, and the solder column array configured to decrease in has a first height over time, from in the first assembled state and a second height, less than the first height, in to the second assembled state, in response to application of the compressive load until a substantial portion of the compressive load is shifted to the supports.

27. (Previously Presented) The system of claim 26 wherein the support second means for mechanically connecting the means for performing circuit functions to the means for carrying circuit components comprises:

a lid of the integrated circuit package that extends outwardly over an edge of the substrate; and

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a plurality of supports with one support disposed at each corner of the integrated circuit package underneath the lid of the integrated circuit package, and each support sized and shaped to enable the gap between the lid of the integrated circuit package and the supports in the first assembled state of the system, and to enable contact between the lid of the integrated circuit package and the supports without the gap in the second assembled state of the system.

28. (Currently Amended) An electronic component system comprising:

a printed circuit board;

an integrated circuit package including a substrate having a solder column array connecting the integrated circuit package to the printed circuit board and a lid, the lid including an extended portion that extends outwardly from the substrate over an edge of the substrate; and

a plurality of supports with one support disposed at each corner of the integrated circuit package underneath the lid of the integrated circuit package, each support comprising a pair of wing portions that are generally perpendicular to each other and joined together at one end to define a corner, each support and being sized and shaped to leave a gap between the extended portion of the lid of the integrated circuit package and the supports in a first assembled state of the system, and to contact and support the extended portion of the lid of the integrated circuit package via the wing portions of the without the gap in a second assembled state of the system;

a single band sized and shaped to surround and contact all of the supports and apply a lateral force against the wing portions and the corner of the supports to secure the supports in position underneath the extended portion of lid of the integrated circuit package and to maintain the supports in position relative to the printed circuit board;

a compressive force mechanism configured to apply a compressive force on the integrated circuit package against the printed circuit board in both the first assembled state of the system and the second assembled state of the system, with the compressive force translated through only the solder column array in the first assembled state of the system and translated through both the solder column array and the supports via the extended portion of the lid in the second assembled state of the system; and

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a heat sink mounted on top of the lid of the integrated circuit package, the lid being separable from and independent of the heat sink, with the heat sink being removably secured relative to the integrated circuit package via the compressive force,

wherein the solder column array maintains electrical and mechanical connection between the printed circuit board and the substrate in both the first assembled state and the second assembled state, and the solder column array has a first height in the first assembled state of the system; and the solder column array has a second height, less than the first height, in the second assembled state of the system; is configured to decrease in height over time in response to application of a compressive load on the lid of the integrated circuit package until a substantial portion of the compressive load is shifted from the lid of the integrated circuit package to the supports in the second assembled state of the system.

29. (New) The system of claim 28, where in the electronic component system comprises a computer system.